Resource Finding and Recovery

Industry experience clearly shows that petroleum reserves and production increase directly as a result of the development and implementation of new exploration technology.

Advances in seismic technology in recent years have made seismic imaging technology the tool of choice not only for explorationists but also for reservoir and production engineers. Modern seismic imaging technology has prevented numerous dry holes. Typical savings from elimination of a single subsalt dry hole are estimated at $12 million.

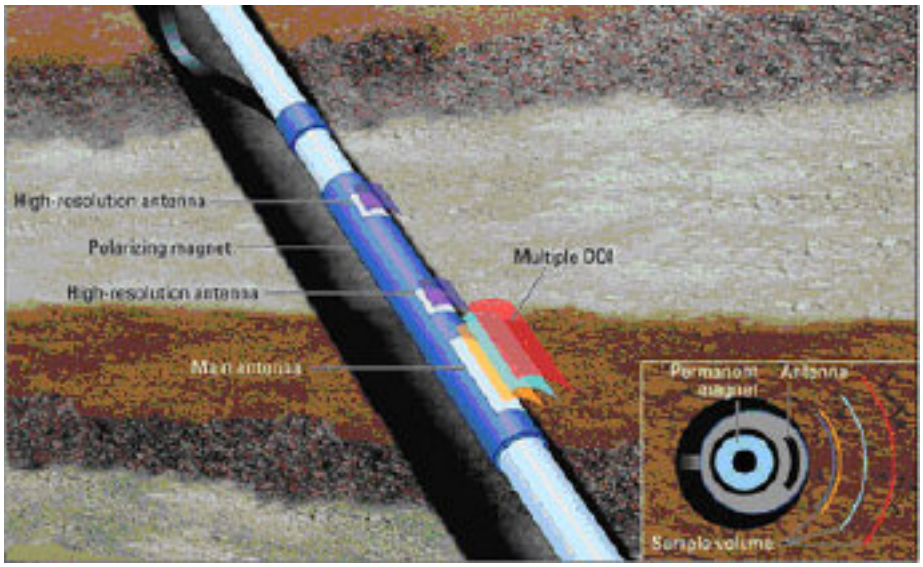
Continuing improvements in seismic imaging will yield even better and faster ways of improving success ratios and reducing risk in oil fields.

The Resource Finding and Recovery Program includes the E&P activity area Advanced Diagnostics and Imaging Systems (ADIS). Its focus is to solve problems and reduce uncertainties across the entire range of exploration, development, and production operations.

ADIS targets technology developments in seismic and other imaging technologies, geologic modeling tools, reservoir characterization, and reservoir modeling that are designed to solve problems and reduce uncertainties across the entire range of exploration, development, and production operations.

Oil reserves occur over a wide variety of architectural heterogeneities (rock facies geometry, fracturing, and stratigraphic and structural setting), each of which poses unique hurdles. Porosity, relative permeability, pore and pre-throat morphology, capillary forces, miscibility, and saturation variations also contribute to technical barriers.

ADIS is directed toward cross-cutting interdisciplinary research to overcome these barriers, thereby enabling cost-effective exploration and recovery of oil reserves.



Resource Finding and Recovery: Advanced Diagnostics and Imaging Systems

The Advanced Diagnostics and Imaging Systems (ADIS) program is an outgrowth of reservoir characterization efforts going back to the mid-1980s. ADIS supports research for cost-effective exploration and exploitation by increasing accuracy and resolution of subsurface imaging technology for finding and defining oil reserves. It focuses on improving technologies for 1) data acquisition, processing, modeling, and interpretation; 2) regional geologic studies and basin analysis; and 3) reservoir characterization.

Advances in seismic processing, interpretation, time-lapse, vertical seismic profiling, crosswell imaging, acoustic imaging, and tomography all have benefited from DOE funding in the development, testing, and demonstration phases. The technologies resulting from this program have reduced risk, lowered costs, and increased ultimate oil and gas recovery.

For example, the Subsalt Seismic Imaging Project developed new algorithms, seismic image processing, and computer techniques for better imaging of oil reserves beneath salt layers. A number of 100-million-bbl oil fields utilizing these technologies have been discovered in this elusive but potentially prolific new trend in the Gulf of Mexico.

For the future, goals of the ADIS program are to:

- Develop tools and analytical techniques to image deeper, more complex reservoirs.
- Develop tools and techniques to increase the resolution of geological imaging.
- Develop computational techniques to more efficiently process and interpret large datasets.
- Integrate geophysics, surface and subsurface geology, and production and well data into 3-D models.

ADIS projects

NETL's ADIS projects are designed to:

- Develop technology to increase accuracy and resolution of imaging techniques for finding and defining oil and gas reservoirs.
- Support development of technologies needed to provide detailed reservoir architecture, rock fluid distribution, and fluid-flow properties to maximize production in new and mature fields.
- Foster the use of data collection and analysis techniques for reservoir characterization and the integration of data to maximize ultimate recovery, define additional potential, and reduce risks associated with oil and gas exploration, development, and production.
- Develop new geologic models and exploration concepts of basin analysis for finding additional reserves.
- Integrate multiple technologies and reservoir models for maximum economic oil and gas recovery.
- Promote technology development for exploration and production, data acquisition, processing, modeling, and interpretation.
- Implement regional geologic studies and basin analyses for finding new petroleum reserves.
- Characterize petroleum reserves for better recovery technology.

Benefits

ADIS processes will help enable industry to:

- Develop better techniques for creating and visualizing data objectives in 3-D and 4-D reservoir datasets for locating and producing petroleum reserves.
- Improve interwell imaging interpretation using crosswell seismic and microholes for finding additional oil and gas reserves in mature fields.
- Combine seismic and electromagnetic techniques for locating bypassed reserves and delineating subtle features.
- Develop techniques for exploring in complex geological settings (such as fractured reservoirs, salt structures, deep sea sediments, etc.).
- Extract stratigraphic information from seismic data for better understanding of oil and gas reservoirs in order to improve production.
- Characterize and manage reservoirs with improved simulation techniques and reservoir models, thereby increasing hydrocarbon recovery.